THEME: **ALGEBRA**

TOPIC: **ALGEBRA**

EXPRESSING ALGEBRAIC PHRASES AS EXPRESSIONS

Examples

Express the following phrases as expressions

1. The sum of 9 and m.
   (9 + m)
2. The difference of 10 and k.
   (10 – k)

Ref: Old MK pupils' book6 pages 374

3. $\frac{3}{5}$ of a number
   $\frac{3}{5}y$
4. Thrice the difference of m and n.
   3(m + n)
5. Double the sum of 3k and 4.
   2(3k + 4)
6. Half of m.
   $\frac{1}{2}$m
7. Square of a number.

Let the number be m

M^2

8. Five times the sum of 2w and 2y
   5(2w + 2y)
9. Divide twice the difference between 3n and 5.

$$\frac{(3n-5)}{2}$$

Activity

1. Express the following phrases as expressions.
2. Double the difference between 3k and 16
3. The difference between 3m and 6 divided by k
4. The sum of 3p and 10 multiplied by y
5. Triple the difference between 3m and r
6. Divide the difference between d and f by the product of w and 5c
7. Half the sum of m and 19 plus thrice the difference of m and 36
8. Third the sum of m and d plus half the product of n and k.
9. Half the difference between k and 8.
10. Square the sum of 7 and p and add it to the sum of y and 17.

11. Thrice the difference between n and 18.
12. Four times the sum of r and 3k
13. Subtract the sum of r and p from the sum of 2p and w
14. Add the sum of 4a and 3b times five to twice the difference between b and c.
15. Multiply the difference between 2d and c by 5b.

EXPRESSING ALGEBRAIC EXPRESSIONS AS PHRASES.

Examples

Express the following as expressions

1. (18 – W)
   The difference of 18 and w.

2.4n + 3

The sum of 4n and 3

3.4(4m + p)

Four times the sum of 4m and p.

4.$\frac{1}{3}$ $(4m + n)$

A third of the sum of 4m and n

5. Y^2

The square of y

6. k^3

The cube of k

7.$\frac{n}{5} - 3$

Divide a number by five and subtract 3 from the quotient

8.$\frac{x-4}{5}$

Divide the difference between x and 4 by five

9.$(p+8)^2$

Square the sum of p and 8

10.$\frac{5(y+2)}{6}$

Five times the sum of y and 2 divided by six.

11.$\frac{3+6m+5k+7w}{4}$

The average of 3, 6m, 5k and 7w

Ref: Old MK pupils' book6 pages 375

ACTIVITY

Express the following expressions as phrases.

a) n-19
b) 3k +20
c) 3(a - 8)
d) w^2
e) $\frac{m}{3} + 5$
f) 4(5b + 7)
g) $\frac{k}{9}$
h) $\frac{3k+3+y+3r}{4}$
i) $\frac{w+8}{2}$
j) W^2 -10
k) $(P- 6)^2$
l) $\frac{3q+18}{3}$
m) $\frac{5a-9}{2}$

COLLECTING LIKE TERMS

Examples

1. Write in short: a + a + a

(a + a) + a

2a + a

3a

2. Simplify: x + y + 2x + 3y

(x + 2x) + (y + 3y)

3x + 4y

3. Simplify: 5a + b + a – 2b + 3b + 4a

(5a + a + 4a) + (3b + b) – 2b

10a + 4b – 2b

10a – 2b

4. Simplify 7y – 8m + y + 10m – 6

7y + y + 10m – 8m – 6

8y -2m – 6

5. Simplify: 2ab + ab + 5ab

3ab + 5ab

8ab

6. Simplify: $7a^2b^2c- 3a^2b^2$

$4a^2b^2c$

7. Simplify: 13y – ⁻3y- 6y

(13y – ⁻3y)- 6y

(13y +3y)- 6y

16y – 6y

10y

8. Simplify: 4w -9k + 2 + 3k – 8w

4w – 8w + 3k – 9k + 2

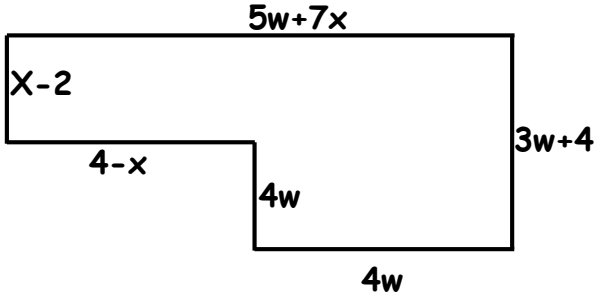
-4 – 6 + 2

8. Simplify: -b+4p+2b-6p

-6p + 4p + 2b – b

-2b + b

9. Find the perimeter of the figure below.



P= 5w + 7x + 3w + 4 + 4w + 4w + 4 –x + x-2

P= 5w + 3w + 4w + 4w + 7x + x – x + 4 +4 – 2

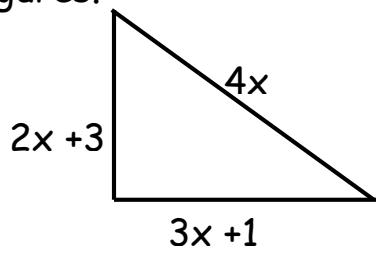
P= 16w +7x + 6

Activity

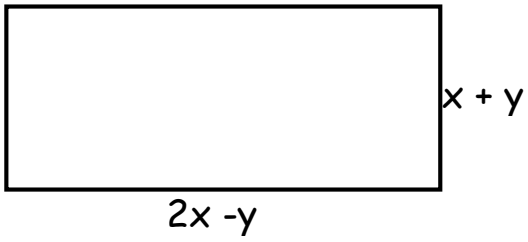
1. Simplify the following
   a) 6y – 4 + 3y +13
   b) 6p + 4x - 8p + x
   c) 14k – 3w -7k
   d) m + 4n +3m – 5n +6n
   e) 7ac – 5ad – 10ac + 3ad
   f) 3xy + 4xy – 5ac + 6ac
   g) 6ab – 2ab – 3ab
   h) 8x + 7y – 3x + 3y
   i) $Ab^2 + 3ab^2 + 5ab^2$
   j) $3ap^2 + 4ap^2$
   k) $11x^2y - 6xyz + 4x^2y - 2xyz$

2. Find the perimeter of the following figures.

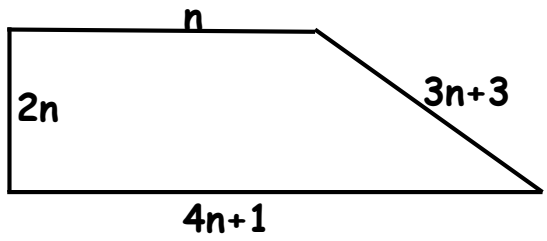
a)



b)



c)



SUBSTITUTION

Examples

1. Given that a=5, b=4 and c=2.

a) Find abc

a x b x c

5 x 4 x 2

40 2

40

b) Find a + b + c

(a + b) + c

(5 + 4) + 2

9 + 2

11

c.) 6a -3bc

(6 x a) – (3 x b x c)

(6 x 5) – (3 x 4 x 2)

30 – (12 x 2)

30 -24

6

2. Given that p= -3, q = 4 and r = 5

a.) Find pqr

p x q x r

-3 x 4 x 5

-12 x 5

-60

b.) Find p + q + r

p + q + r

-3 + 4 + 5

(4 + 5) - 3

9 – 3

6

c.) Find r (q + p)

5(4 -3)

5 x 1

5

d.) Find $6p^2$ – 2rq

$6(p \times p)$ – (2 x r x q)

$6(-3 \times -3)$ – (2 x 5 x 4)

6 x 9 – 40

54 – 40

14

2. Given that m = $\frac{2}{9}$ and w = $\frac{1}{3}$

a.) Find m ÷ w

$\frac{2}{9} \div \frac{1}{3} = \frac{2}{\cancel{9}} \times \frac{\cancel{3}}{1} = \frac{2}{3}$

Ref: New MK pupils' book 6 page 376

Activity

1. Given that a=5, b=7, c=9,d=4,f=6 and e=2.Find the value of;
   i) a+b+c ii) (a+b)+cd iii) 4(a+e) iv) $\frac{a(a-d)}{a}$ v) $\frac{bf}{e}$
2. Given that x=2, y=-3 and z=-5.Find the value of xzy
3. Given that y=10,z=15.Find $\frac{yz}{y+z}$
4. Given that x=$\frac{2}{3}$ and y=$\frac{1}{3}$.Find x + y
5. If m=$\frac{4}{5}$ and n=$\frac{1}{5}$, find the value of$\frac{m}{n}$.
6. If p=$\frac{1}{8}$, y=$\frac{2}{3}$ and z=$\frac{4}{5}$.Find the value of$\frac{xy}{z}$.
7. If p=$1\frac{1}{3}$,q=$2\frac{1}{2}$, find the value of pq-$\frac{1}{3}$
8. Given that x=$\frac{2}{3}$,y=$\frac{1}{4}$ and z=$\frac{-1}{2}$, find the value of x+y+z
9. If m=$\frac{3}{4}$ and n=$\frac{1}{5}$, find the value of 12m -10n
10. If x=$\frac{1}{2}$,y=$\frac{3}{4}$ and z=$\frac{1}{4}$, find the value of x(y-z)

REMOVING BRACKETS

Examples

Simplify the following:

a).3(x + y)

3x + 3y

b) -4(m + 3w)

-4m -12w

c) -5(2p – 7)

-10p + 35

d) -p(3p - 5ap)

(-p x 3p) + (p x 5ap)

$3p^2 + 5ap^2$

Simplify the following:

a) -2(x + y)
b) -3(-x + y)
c) –(p – y + z)
d) g(2a + w)
e) (3d + b)(y)
f) (3 + b + c)d
g) (-2k + y -y)-h
h) -4h(3x + 5h)

Ref: New MK pupils' book 6
Pages 380 - 382

REMOVING BRACKETS

Examples

1. Simplify the following

a) $(x + 2) + (x + 3)$

$x + 2 + x + 3$

$x + x + 2 + 3$

$2x + 5$

b) $3(x + 2) + 2(x-1)$

$3x + 6 + 2x - 2$

$3x + 2x + 6 - 2$

$5x + 4$

c) $3(x + 1) - 2(x - 1)$

$3x + 3 - 2x + 2$

$3x - 2x + 3 + 2$

$x + 5$

d) $2(y - 2) - 3(y - 1)$

$2y - 4 - 3y + 3$

$2y - 3y + 3 - 4$

$-y - 1$

e) Subtract $3p - 1$ from $5p - 3$

$5p - 3 - (3p - 1)$

$5p - 3 - 3p + 1$

$5p - 3p + 1 - 3$

$2p - 2$

f) Subtract $y+1$ from $2y + 1$

$2y + 1 - (y + 1)$

$2y + 1 - y - 1$

$2y - y + 1 - 1$

$y + 0$

y

g) $\frac{1}{3}(3a + 9b)$

$\frac{1}{\cancel{3}} \times \overset{a}{\cancel{3a}} + \frac{1}{\cancel{3}} \times \overset{3b}{\cancel{9b}}$

$a + 3b$

h) $\frac{1}{2}(2x + 8y) + \frac{1}{3}(6x + 9y)$

$\frac{1}{\cancel{2}} \times \overset{x}{\cancel{2x}} + \frac{1}{\cancel{2}} \times \overset{4y}{\cancel{8y}} + \frac{1}{\cancel{3}} \times \overset{2x}{\cancel{6x}} + \frac{1}{\cancel{3}} \times \overset{3y}{\cancel{9y}}$

$x + 4y + 2x + 3y$

$x + 2x + 4y + 3y$

3x + 7y

i)) $\frac{1}{2}(4a + 6ab)$ - $\frac{2}{3}(9a - 12ab)$

$$\frac{1}{\cancel{2}} \times \overset{2a}{\cancel{4a}} + \frac{1}{\cancel{2}} \times \overset{3ab}{\cancel{6ab}} - \frac{2}{\cancel{3}} \times \overset{3a}{\cancel{9a}} - \frac{2}{\cancel{3}} \times \overset{4ab}{\cancel{12ab}}$$

2a + 3ab - 6a + 8ab

2a - 6a + 3ab + 8ab

-4a +11ab

j) What is difference between $\frac{1}{7}(7ab - 14pq)$ and $\frac{1}{5}(10ab + 15pq)$

$$\frac{1}{\cancel{7}} \times \overset{ab}{\cancel{7ab}} + \frac{1}{\cancel{7}} \times \overset{2pq}{\cancel{14pq}} - \frac{1}{\cancel{5}} \times \overset{2ab}{\cancel{10ab}} + \frac{1}{\cancel{5}} \times \overset{3pq}{\cancel{15pq}}$$

ab + 2pq - 2ab + 3pq

ab - 2ab + 2pq + 3pq

-ab+5pq

Activity

Simplify the following:

a) (x + 2) - (x + 3)
b) (2x + 3) + (x + 4)
c) 6(y + 1) - 2(y - 3)
d) -2(x - 4) - 2(x - 1)
e) 5(t - 3) + (2t - 4)
f) 3(m + 2) + 4(m - 1)
g) 2(q - 1) + 3(q - 2)
h) Add 4(p + w) to 5(p - w)
i) $\frac{3}{4}(8m - 12p)$
j)) $\frac{1}{2}(2x + 8y)$ - $\frac{1}{3}(6x - 9y)$

2. What is the difference between $\frac{1}{10}(20t + 50p)$ and $\frac{1}{9}(18t - 36p)$?

Ref: New MK pupils' book 6
Pages 380 - 382

FORMING AND SOLVING EQUATIONS BY SUBTRACTING

Examples

1. Solve $\square + 6 = 20$

$\square + 6 - 6 = 20 - 6$

$\square = 14$

2. $11 + a = 23$

$11 - 11 + a = 23 - 11$

$a = 12$

3. Solve for y: $y + 12 = 48$

$y + 12 = 48$

$y + 12 - 12 = 48 - 12$

$y = 36$

4. $16 + y = 20$

$16 - 16 + y = 20 - 16$

$y = 4$

5. I think of a number, add 9 on it, the result is 14. What is the number?

Let the number be m

$m + 9 = 14$

$m + 9 - 9 = 14 - 9$

$m = 5$

Therefore the number is 5.

6. Jane had some money, her father added her more sh.1500 in total she has sh. 2300. How much money did she have at first?

Let the money she had be z.

z + sh.1500 = sh.2300

z + sh.1500 –sh.1500 = sh.2300 –sh.1500

z =sh. 800

Therefore she had sh.800 at first.

Ref: New MK pupils' book 6
Pages 385

Exercise

1. Solve the following equations:
   a) $\square + 3 = 9$
   b) $\square + 13 = 35$
   b) $g + 7 = 13$
   d) $v + 34 = 62$
   e) $15 + x = 38$
   f) $16 + m = 35$
2. I think of a number, add 16 to it the answer is 25. What is the number?
3. Think of a number; add 25 to it the result is 40. What is the number?
4. Tom had some eggs, his mother added him more 16eggs, he has 29 eggs now. How many eggs did he have at first?
5. What number must be added to 69 to get 90?

SOLVING EQUATIONS BY ADDING

Examples

1. Solve $\square - 34 = 7$

   $\square - 34 + 34 = 7 + 34$

   $\square = 41$

2. Solve for y: $y - 11 = 54$

   $Y - 11 + 11 = 54 + 11$

   $Y = 65$

3. I think of a number subtract 9 from it, the result is 6. What is the number?

   Let the number be z

   $Z - 9 = 6$

   $Z - 9 + 9 = 6 + 9$

   $Z = 15$

   Therefore the number is 15.

4. Anne had some books; the teacher took away 13books from her, she remained with 5books. How many books did she have at first?

   Let the books she had at first be w

   $W - 13 = 5$

   $W - 13 + 13 = 5 + 13$

   $W = 18$

   Therefore she had 18 books at first.

Ref: New MK pupils' book 6
Page 386

Exercise

1. Solve the following equations:

   a) $\square - 12 = 13$ b) $\square - 7 = 6$ c) $24 - \square = 13$

   d) $Y - 23 = 12$ e) $m - 14 = 33$

2. I think of a number, subtract 20 from it, the result is 14. What is the number?
3. There were some eggs in the basket. 27 eggs got broken. 17 eggs remained. How many eggs were in the basket at first?
4. Mr. Balikudembe had some cows in the farm. He sold 19 cows and remained with 23 cows. How many cows did he have at first?

5. After selling 49 eggs, the farmer remained with 64eggs. How many eggs did the farmer have at first?
6. Akiiki harvested some sacks of potatoes. She sold 15 of them and kept 2 for the family. Find the number of sacks she harvested?

SOLVING EQUATIONS BY MULTIPLYING

Examples

1. Find the missing number; □÷3 = 6

□÷ 3 x 3 = 6 x 3

□ = 18

Ref: New MK pupils' book 6 Page 389

2. Find the value of b. b ÷ 4 = 20

b ÷ 4 x 4 = 20 x 4

b = 80

2. Find the value of p. $\frac{p}{5} = 10$

$\frac{p}{5} \times 5 = 10 \times 5$

P = 50

4. Solve for y: 2y ÷3 = 8

2y ÷3 x 3 = 8 x 3

= 24

$\frac{2y}{2} = \frac{24}{2}$

y = 12

4. A man equally divided his money among 5 children and each got sh.450.How much money did he give out?

Let k be the amount he gave out

k÷ 5 = sh.450

k÷ 5 x 5 = sh.450 x 5

k = sh.2250

He gave out sh.2250 altogether.

5. Find the number of apples that can be divided among 8 girls such that each girl gets 12 apples.

Let the number of apples be m

$m \div 8 = 12$

$m \div 8 \times 8 = 12 \times 8$

$m = 96$ apples

The number is 96 apples.

6. What amount of money is needed to pay 15 workers if each worker earns sh.3000?

Let the amount needed be m

$m \div 15 = sh.3000$

$m \div 15 \times 15 = sh.3000 \times 15$

$m = sh.45000$

Sh.45000 is needed to pay 15 workers

Activity

1. Find the missing number in each of the following:

a) $\square \div 5 = 30$ b) $\square \div 9 = 12$

2. Solve the following equations:

i) $k \div 6 = 13$ ii) $\frac{w}{12} = 6$ iii) $3k \div 5 = 6$ iv) $\frac{2k}{9} = 10$

3. Four pupils shared x books equally. Each pupils received 16 books. How many books were there?

4. What number when divided by 7 gives 6?

5. When a number is divided by 8, the result is 15.What is the number?

6. Trailers were loaded with equal bags of cotton. Each trailer loaded 120 bags. How many bags were there altogether?

7. A farmer distributed x cows among 12 women. Each woman got 8 cows. How many cows did the farmer have?

8. A trade hired 8 trucks to carry bags of salt. Each truck carried 96 bags. How many bags were there altogether?

FORMING AND SOLVING EQUATIONS BY DIVIDING

Examples

Ref: New MK pupils' book 6
Pages 387

1. Solve the following equations.

a) $\square \times 8 = 48$

$\square \times 8 \div 8 = 48 \div 8$

$\square = 6$

b). $7b = 28$

$$\frac{\overset{b}{\cancel{7}b}}{\cancel{7}} = \frac{\overset{4}{\cancel{28}}}{\cancel{7}_{1}}$$

$b = 4$

c) $2y \div 3 = 8$

$2y \div 3 \times 3 = 8 \times 3$

$= 24$

$$\frac{\overset{y}{\cancel{2y}}}{\cancel{2}} = \frac{\overset{12}{\cancel{24}}}{\cancel{2}_{1}}$$

$y = 1$

2. The cost of 12 pens is sh.6000.What is the cost of each pen?

Let h be the cost of each pen

$12h = sh.6000$

$$\frac{\cancel{12h}}{\cancel{12}} = \frac{\overset{500}{\cancel{sh6000}}}{\cancel{12}_{1}}$$

$h = sh.500$

Each pen costs sh.500

3. A number multiplied by 7 gives 42.What is the number?

Let r be the number

$r \times 7 = 42$

$r \times 7 \div 7 = 42 \div 7$

$r = 6$

The number is 6

4. Nine buses carried k passengers each. Altogether the carried 540 passengers. How many passengers did each bus carry?

K x 9 = 540

K x 9÷ 9 = 540 ÷9

K = 60

Each bus carried 60 passengers

Activity

1. Solve the following equations:

a) □ x 4 = 36 b) 5n = c) 256

2. A number multiplied by 15 gives 90.Find the number.

3. The product of two numbers is 120.one of the numbers is 8. Find the second number.

4. A school received 980 pens in 7 equal boxes. How many books were in each box?

5. I think of a number, multiply it by 9.The result is 108, what number have I thought of?

MORE SOLVING EQUATIONS BY DIVIDING

Examples

Ref: New MK pupils' book 6
Pages 388-391

1. Solve for m.

   m + m +m = 45

   3m = 45

   $\frac{\cancel{3}m}{\cancel{3}} = \frac{\cancel{45}}{\cancel{3}}$

   m = 15

2. Jane is m years old, Matthew is three times as old as Jane. If their total age is 40years.Find Jane's' age.

   m + 3m = 40

   4m = 40

   $\frac{\cancel{4}m}{\cancel{4}} = \frac{\cancel{40}}{\cancel{4}}$

   m = 10

   Jane is 10 years.

Activity

1. Solve the equations below:

a) 4y + y = 200 b) 7p + 8p = 60 c) 7k – 3k = 32

2. Teddy is h years, her father is four times as old as Teddy. If their total age is 60 years. How old is each of them?

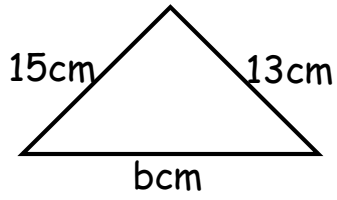
3. A mother is 5x years old and daughter 2x years. Their total age is 56 years. How old is each now?

4. Kent has thrice as many books as Batte. If both have 36 books, how many books does Batte have?

SOLVING EQUATIONS (GIVEN PERIMETER OF SHAPES)

Examples:

1. The perimeter of the figure below is 37cm.Find the value of b.



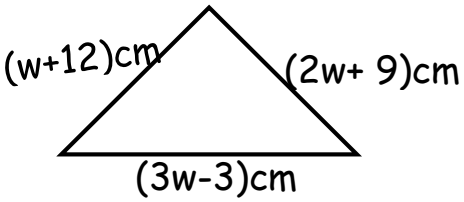
S + S + S = P

b + 15cm + 13cm = 37cm

b + 28cm = 37cm

b + 28cm -28cm = 37cm – 28cm b = 12cm

2. The perimeter of the figure below is 48cm. Find the value of w



S + S + S = P

(w + 12) + (2w + 9) + (3w – 3) = 48cm

w + 2w + 3w + 12 + 9 – 3)cm = 48cm

6w + 18cm = 48cm

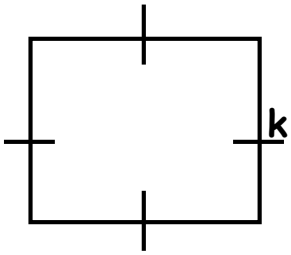
6w + 18cm – 18cm = 48cm – 18cm

6w = 30cm

$\frac{\cancel{6}w}{\cancel{6}} = \frac{\cancel{30}}{\cancel{6}}$

W = 5

3. The perimeter of a square below is 44m.Find the value of k.



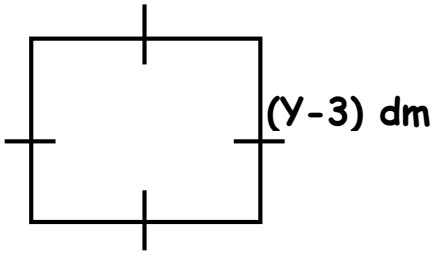
4S = p

4k = 44m

$\frac{4k}{4} = \frac{\cancel{44m}}{4}$ 11

k = 11m

4. The perimeter of the figure below is 64dm.Work out the value of y.



S + S + S + S = P

Y – 3 + y – 3 + y – 3 = 64dm

4y - 12 = 64dm

4y – 12 + 12 = 64 + 12

4y = 76

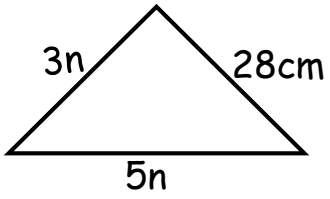
19

$\frac{4y}{4} = \frac{\cancel{76}}{4}$

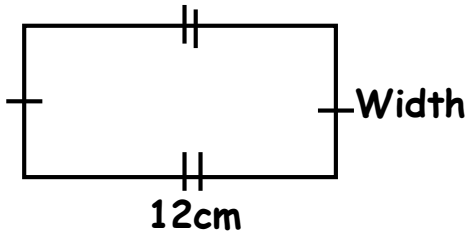
Y = 19

Activity

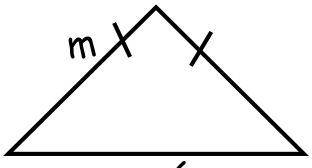
1. The perimeter of the triangle below is 70cm.Find the value of n.



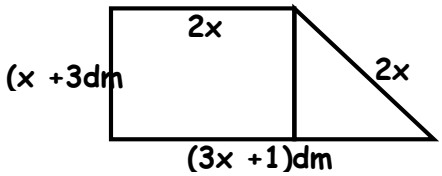
2. The perimeter of the rectangle below is 38cm.Find the width.



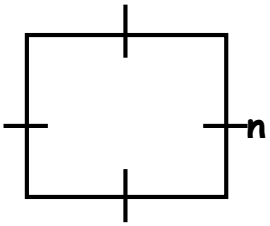
3. The perimeter of an isosceles triangle is 36cm.Find the value of m.



4. The p er of the figure below is 44dm.Find the value of x .



5. The perimeter of a rectangle is 40dm.Its length is (x + 4)cm and width is xdm.Find the value.
6. The perimeter of the square below is 24mm.Find the value of n.



Ref: New MK pupils' book 6
Page 391

FINDING MISSING SIDE OF SHAPES GIVEN AREA.

Examples

1. The area of a rectangle is $42cm^2$ and its width is 6cm.Find the length.

L x W = Area

L x 6cm = $42cm^2$

6cmL = $42cm^2$

$$\frac{\cancel{6cm}\ L}{\cancel{6cm}} = \frac{\cancel{42cm}\ \times cm}{\cancel{6cm}}$$

L = 6cm

2. The area of a triangle is $36cm^2$ and base is 9cm.Find its height.

$\frac{1}{2} \times$ base $\times$ height = Area

$\frac{1}{2} \times 9cm \times h = 36cm^2$

$\frac{9hcm}{2} = 36cm^2$

$\frac{\cancel{9}hcm}{\cancel{2}} \times \frac{\cancel{2}}{\cancel{9}} = \cancel{36}cm^2 \times \frac{2}{\cancel{9}}$ (4)

h = 4cm x 2

h = 8cm

3. A cuboid is 4cm long and 3cm wide. If its volume is $48cm^3$, find its width.

l x w x h = vol.

4cm x 3cm x h = $48cm^3$

$12cm^2h = 48cm^3$

$$\frac{\cancel{12cm \times 12cm}h}{\cancel{12cm \times cm}} = \frac{\cancel{48cm \times cm} \times cm}{\cancel{12cm \times cm}}$$

h = 4cm

Ref: New MK pupils' book 6 Page 391

Activity

1. The area of a rectangle is $60cm^2$ and length is 15cm.Work out width.
2. The area of a triangle is $40cm^2$ and its height is 8cm.Find its base.
3. The area of a triangle is $30cm^2$ and its base is 12cm. Work out its height.
4. A rectangle has an area of $50dm^2$ and width of 5cm.Find its length.
5. The area of a parallelogram is 28cm. If its base is 7cm, work out the height.
6. A cuboid is 9cm long and 5cm high. If its volume is $90cm^3$, calculate its width.

FORMING AND SOLVING ALGEBRAIC EQUATIONS

Examples

1. A boy is 2years older than his sister. Their total age is 20years.How old is the sister?

   Let r be the sister's age

Sister's age	Boy's age	Total age
r	r+2	20

   r + r + 2 = 20

   2r+ 2 = 20

   2r + 2 – 2 =20 -2

   2r = 18

   $\frac{\cancel{2}r^{1}}{\cancel{2}} = \frac{\cancel{18}^{9}}{\cancel{2}}$

   $_{1}$

   r = 9 years

2. A girl is 20years younger than the mother. The sum of their age is 70yeras.How old is the mother?

   Let p be the mother's age

mother's age	girl's age	Total age
p	P -20	70

p + p - 20 = 70

2p - 20 = 70

2p - 20 + 20 =70 +20

2p = 90

$\frac{\cancel{2}p^{1}}{\cancel{2}} = \frac{\cancel{90}^{45}}{\cancel{2}}$

$_{1}$

p = 45 years

3. Kampi weighs 10kg heavier than Betty. If their total weight is 64kg.Find the weight of Kampi.

   Let p be Betty's weight

Betty	Kampi	Total weight
p	P +10	64

   p + p + 10 = 64

   2p + 10 = 64

2p + 10 - 10 =64 10

2p = 54

$\frac{2p^{1}}{2} = \frac{54^{27}}{2}$

$_{1}$ $_{1}$

p = 27 kg

Kampi's weight = (27+10) kg

= 37kg

4. Jane is twice as old as Jack. Their total age is 66years.How old is Jane in 4years time?

Let k be Jack's age

Jack	Jane	Total age
k	2k	66

k + 2k = 66

3k = 66

$\frac{3k^{1}}{3} = \frac{66^{11}}{3}$

$_{1}$

k = 11years

Jane's age = (2x11) years

= 22years

Activity

1. Okum has 7 more goats than Martin. Altogether they have 29 goats. How many goats does Martin have?
2. Nakamatte got 8 more pens than the sister. The sum of their pens is 22.How many pens did the sister get?
3. Kiku is 9 years older than Kapere. Their total age is 29years.How old is Kapere?
4. Muto is 8 years younger than Ongom.If the sum of their age is 24 years. How old is Ongom?
5. A woman earns sh.3000 less than the husband. Their wage is sh.9000.
   a)How much does the man earn?
   b) How much does the woman earn?

6. Sarah has 400 less birds on the farm than Sauda.The sum of the birds on the farm is 2000.How many birds does each have?

SOLVING EQUATIONS INVOLVING BRACKETS

Examples

Solve the following equations:

a) $3(Y + 4) = 21$

$3Y + 12 = 21$

$3Y + 12 - 12 = 21 - 12$

$3Y = 9$

$\frac{3y}{3} = \frac{9^{3}}{3}$

$Y = 3$

b) $4(y - 3) = 16$

$4y - 12 = 16$

$4y - 12 + 12 = 16 + 12$

$4y = 28$

$\frac{4y}{4} = \frac{28^{7}}{4}$

$Y = 7$

c) $2y^2 = 18$

$\frac{2y^2}{2} = \frac{18^{9}}{2}$

$\sqrt{Y^2} = \sqrt{9}$

$Y = 3$

d) $4(x^2 - 1) = 32$

$4x^2 - 4 = 32$

$4x^2 - 4 + 4 = 32 + 4$

$4x^2 = 36$

$\frac{4x^2}{4} = \frac{36^{9}}{4}$

$\sqrt{x^2} = \sqrt{9}$

$x = 3$

Activity

Solve the following equations

1. y2 + 3 = 28
2. q2 – 7 = 18
3. $5x^2 = 45$
4. $7x^2 = 567$
5. $2(m + 3) = 18$
6. $6(3x - 2) = 50$
7. $6(x^2 + 2 = 306$
8. $4(x^2 - 1) = 21$

Ref: New MK pupils' book 6 Page

SOLVING EQUATIONS INVOLVING

Examples

Solve the following equations

1. $4x - 3 = x + 6$

$4x - x = 6 + 3$

$3x = 9$

$\frac{3x}{3} = \frac{9}{3}$ (3)

$x = 3$

2. $2m + 4 = m + 6$

$2m - m = 6 - 4$

$m = 2$

3. $4n - 9 = 15 - 2n$

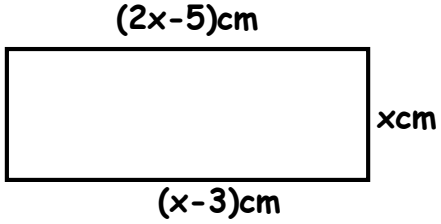
$4n + 2n = 15 + 9$

$6n = 24$

$\frac{6n}{6} = \frac{24}{6}$ (4)

$n = 4$

5. Study the rectangle below and find the value of x



Length = length

$2x - 5 = x - 3$

$2x - x = -3 + 5$

$X = 2$

Ref: New MK pupils' book 6
Pages 393 -394

Activity

1. Solve the following equations

a) $9 + 5x = 4 + x$

b) $11n + 6 = 2n + 19$

c) $13 + 3x = 25 - 3x$

d) $5a - 3 = 2a + 3$

e) $5n + 5 = 8n - 4$

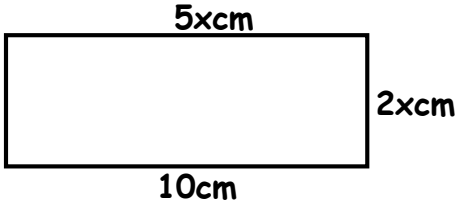
f) $10x - 12 = 9x - 2$

g) $11x + 3 = x + 33$

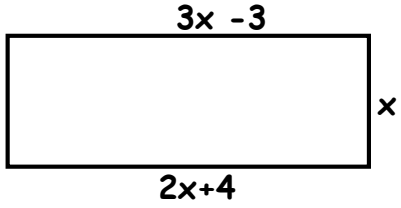
h) $6x - 8 = 4x + 4$

2. Find the value of x in the figures below;

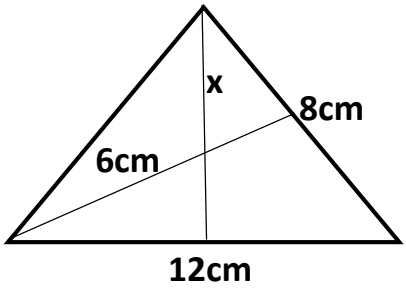
a)



b)



c)



SOLVING EQUATIONS INVOLVING FRACTIONAL TERMS

Examples

Solve the following equations:

1. $\frac{1}{2}P = 6$ Multiply each term by the reciprocal of the fraction.

$\frac{1}{\cancel{2}}P \times \frac{\cancel{2}}{1} = 6 \times \frac{2}{1}$

P = 12

2. $\frac{m}{3} + 6 = 10$

$\frac{m}{\cancel{3}} \times \frac{\cancel{3}}{1} + 6 \times \frac{3}{1} = 10 \times \frac{3}{1}$

m + 18 = 30

m + 18 - 18 = 30 – 18

m = 12

3. $\frac{3m}{4} + 7 = 40$

$\frac{3m}{4} + 7 = 40$

$\frac{\cancel{3m}}{4} \times \frac{4}{\cancel{3}} + 7 \times \frac{4}{3} = 40 \times \frac{4}{3}$

$m + \frac{28}{3} = \frac{160}{3}$

$m + \frac{28}{3} - \frac{28}{3} = \frac{160}{3} - \frac{28}{3}$

$m = \frac{\cancel{132}}{\cancel{3}}$

m = 11

4. $4\frac{1}{3}p + 2 = 15$

$\frac{13p}{3} + 2 = 15$

$\frac{\cancel{13}p}{\cancel{3}} \times \frac{\cancel{3}}{\cancel{13}} + 2 \times \frac{3}{13} = 15 \times \frac{3}{13}$

$P + \frac{6}{13} = \frac{45}{13}$

$P + \frac{6}{13} - \frac{6}{13} = \frac{45}{13} - \frac{6}{13}$

$P = \frac{\cancel{39}}{\cancel{13}}$

P = 3

5. 0.4p +0 .5 = 2.1

0.4p + 0.5 - 0.5 = 2.1 - 0.5

0.4p = 1.6

$\frac{4p}{10} = \frac{16}{10}$

$\frac{\cancel{4p}}{\cancel{10}} \times \frac{\cancel{10}}{4} = \frac{\cancel{16}}{\cancel{10}} \times \frac{\cancel{10}}{4}$

P = 4

6.3x + 7 - $\frac{3x}{4}$ = 10

3x x 4 + 7 x 4 - $\frac{3x}{4} \times 4$ = 10 x 4

12x + 28 – 3x = 40

12x – 3x + 28 = 40

9x + 28 – 28 = 40 – 28

9x = 12

$\frac{9x}{9} = \frac{12}{9}$

X = $1\frac{1}{3}$

7. $\frac{2q^2}{6}$ = 12

$\frac{\cancel{2q^2}}{\cancel{6}} \times \frac{\cancel{6}}{\cancel{2}} = \cancel{12} \times \frac{6}{\cancel{2}}$

$\sqrt{q^2} = \sqrt{36}$

q = 6

8. $\frac{9q^2}{11}$ = 11

$\frac{\cancel{9q^2}}{\cancel{11}} \times \frac{\cancel{11}}{\cancel{9}} = \cancel{11} \times \frac{11}{\cancel{9}}$

$\sqrt{q^2} = \sqrt{\frac{121}{9}}$

q = $\frac{11}{3}$

q=$3\frac{2}{3}$

Ref: New MK pupils' book 7
Pages 393 -394

Activity

Solve the following equations:

1. $\frac{1}{3}x = 20$
2. $2\frac{1}{5}$y =22
3. $p - \frac{2}{3}p = 7$
4. P+$\frac{p}{5} = 6$
5. $1\frac{1}{2}p + 3 = 12$
6. 0.9p + 0.5 = 5.7
7. 0.3t – 5 = 0.2p = 8.1
8. $\frac{m}{5} + 7 = 11$

9. $4-\frac{3t}{4}$ =-2

10. $\frac{3m}{8}+2=7$

10. $\frac{3m^2}{9}=3$

12. $3\frac{1}{8}w^2$ = 8

SOLVING EQUATIONS INVOLVING FRACTIONAL TERMS

Examples

Solve the following equations;

a) $\frac{m+1}{3}+\frac{m}{4}=2$ LCD=12

$(\frac{m+1}{\cancel{3}})\times\cancel{12}+\frac{m}{4}\times\cancel{12}=2\times12$

4(m+1) + 3m = 24

4m + 4 + 3m = 24

7m + 4 = 24

7m + 4 – 4 = 24 -4

7m = 20

$\frac{\cancel{7m}}{\cancel{7}}=\frac{20}{7}$

$m = 2\frac{6}{7}$

b) $\frac{x-5}{2}+\frac{x}{8}=13$ LCD = 8

$(\frac{x-5}{\cancel{2}})\times\cancel{8}+\frac{x}{\cancel{8}}\times\cancel{8}=13\times8$

4x – 20 + x = 104

5x – 20 = 104

5x – 20 + 20 = 104 + 20

5x = 124

$\frac{\cancel{5x}}{\cancel{5}}=\frac{124}{5}$

$X = 22\frac{4}{5}$

c) $\frac{a+4}{3}-\frac{a}{5}=8$ LCD = 15

$(\frac{a+4}{\cancel{3}})\times\cancel{15}-\frac{a}{\cancel{5}}\times\cancel{15}=8\times15$

5a + 20 - 3a = 120

2a +20 = 120

2a +20 - 20 = 120 - 20

2a = 100

$$\frac{\cancel{2a}}{\cancel{2}} = \frac{100}{2}$$

$$X = 50$$

d) $\frac{3x+1}{4} = \frac{x+2}{2}$

$2(3x+1) = 4(x+2)$

$6x + 2 = 4x + 8$

$6x - 4x = 8 - 2$

$2x = 4$

$$\frac{\cancel{2}x}{\cancel{2}} = \frac{4}{\cancel{2}}$$

$$X = 2$$

) $\frac{3x-1}{2} = \frac{7x+1}{6}$

$2(7x+1) = 6(3x-1)$

$14x + 2 = 18x - 6$

$14x - 18x = -6 - 2$

$-4x = -8$

$\frac{-4x}{-4} = \frac{-8}{-4}$

$$x = 2$$

Activity

Solve the following equations

a) $\frac{d-2}{3} + \frac{d}{3} = 4$

b) $\frac{2n+5}{5} + \frac{n}{5} = 8$

c) $\frac{k+3}{4} + \frac{k}{2} = 6$

d) $\frac{x+5}{4} + \frac{x}{5} = 2$

e) $\frac{d+3}{3} = \frac{5d+1}{9}$

f) $\frac{4x-9}{3} = \frac{3x+5}{7}$

g) $\frac{6p+4}{9} = \frac{4p-3}{7}$

h) $\frac{m+2}{5} = \frac{m+1}{20}$

Ref: New MK pupils' book 7
Pages 461-462

INEQUALITIES

Symbols used

$<$ Less than

$\leq$ Less than or equal to

$>$ Greater than

$\geq$ Greater than or equal to

SOLUTION SETS

Solution set is group of possible values that satisfy an inequality

Examples

1. If x is a negative integer, find the solution set for $x>-6$

   X = {-1,-2,-3,-4,-5}

2. Find the solution set for $y<5$ if y is a positive integer.

   Y={1,2,3,4,}

3. Find the solution set for x -4 when x is a negative integer.

   X={-1,-2,-3,-4}

4. Find the solution set for x 5 when x is a whole number.

   X = {0,1,2,3,4,5}

5. Find the solution set for $-2<x<2$

   X ={-1,0,1}

6. Find the solution set for $-1 \leq x < 3$

   X = {-1,0,1,2}

7. Find the solution set for $-4 < x \leq 4$

   X ={-3,-2,1,0,1,2,3,4}

8. Find the solution set for $-3 \leq x \leq 3$

   X ={-3,-2,-1,0,1,2,3}

Ref: New MK pupils' book 7 Pages 444

Activity

If x is an integer, find the solution set for the following inequalities

a)$x>2$ b) $x>8$ c)$x<0$ d)$x<9$ e)$x \geq 0$ f) $x \leq -10$ g)$x \geq 5$ h)$x \geq 4$

i) $2 \geq x \geq -3$ j) $5 > x > 0$ k) $-3 \leq p \leq 4$ l) $-2 < y < 3$

SOLVING AND FINDING SOLUTION SETS

Examples

Solve and find the solution for the following inequalities

a) $K- 9 <5$

K-9+9<5+9

k<14

k={13,12,11,10,9,8,7,6,5,4,3,2,1,0,-1…}

b) P+4 <15

P + 4 – 4 <15 – 4

P < 11

P= {…,-2,-1,0,1,2,3,4,5,6,7,8,9,10}

c) 2w -3 $\geq$ 15

2w – 3 + 3 $\geq$ 15+3

2w $\geq$18

$\frac{2w}{2} \geq \frac{18}{2}$

W$\geq$9

W={9,10,11,12,13,14,15,…}

d)$\frac{2x}{4}$ -3 $\leq$12

$\frac{2x}{4}$ -3+3 $\leq$ 12+3

$\frac{2x}{4} \times 4 \leq 15 \times 4$

$2x \leq 60$

$\frac{2x}{2} \leq \frac{60}{2}$

X$\leq$30

X = {…25, 26, 27, 28, 29, 30}

Activity

Solve and find the solution set for the following inequalities

a) a + 4 $>$ 8

b) y + 5 $\geq$ 7

c) a + 6$\leq$9

d) w – 6$\leq$3

e) p – 3 $\geq$2

f) 9k$\geq$45

g) 7x – 3$\leq$18

h) $\frac{n}{9} \leq 3$

i) $\frac{3t}{8} \geq 8$

SOLVING AND FINDING SOLUTION SETS

Examples

Solve and find the solution set for the following inequalities

a) $2(x+1) \geq 4$

$2x + 2 \geq 4$

$2x + 2 - 2 \geq 4 - 2$

$2x \geq 2$

$\frac{2x}{2} \geq \frac{2}{2}$

$X \geq 1$

$X = \{2,3,4,5,6,7,8\ldots\}$

b) $3(x-1) < 15$

$3x - 3 < 15$

$3x - 3 + 3 < 15 + 3$

$3x < 18$

$\frac{3x}{3} < \frac{18}{3}$

$X < 6$

$X = \{-2,-1, 0, 1, 2, 3, 4, 5\}$

c) $8 > 2x > 2$

$\frac{8}{2} > \frac{2x}{2} > \frac{2}{2}$

$4 > x > 1$

$X = \{2,3\}$

d) $3x-5 \leq 8x +10$

$3x-8x \leq 10 +5$

$-5x \leq 15$

$\frac{-5x}{-5} \geq \frac{15}{-5}$

$X \geq -3$

$X = \{-3,-2,-1, 0, 1, 2, 3, 4\ldots\}$

Activity

Solve and find the solution set for the following

a) $3(y+2) < 6$
b) $4(a+1) \geq 12$
c) $6(x-2) \geq 60$
d) $5(a-3) \geq 10$
e) $10 \geq 2x \geq -4$
f) $8 \leq 4x < 24$
g) $-15 \leq 3x \leq 24$

Ref: New MK pupils' book 7
Pages 447-449

APPLICATION OF INEQUALITIES

Examples

1. The head teacher's car can maximally accommodate maximally 6 people. a) Show this information in an inequality.
   Let k be the range of people it accommodates
   $K \leq 6$

b) Write a solution set for the inequality.
$K = \{1, 2, 3, 4, 5\}$

2. The interview panel can interview more than seven people but less than thirteen people a day. What possible number of people can the panel interview in a day?

$7 < y < 13$
$Y = \{8,9,10,11,12\}$

3. What number can be added to seven gives a number greater than 16?
   Let the number be k
$K + 7 > 16$
$K+7-7 > 16 - 7$
$K > 9$
$K = \{9,10,11,12,13,14,15\}$

Activity

1. Our room can accommodate people seated in sevens up to maximally 49 people.
   a) Write an inequality for the information
   b) What possible number of people can be seated there?
2. What counting number can be added to four to give a number less than 6?

3. Okocha is 8years, Martin is 6 years, and Nakito is 3 years old. A school admits pupils from the age of 5 to 11 years. Which number of the pupils will not be accepted?

4. A ticket states that for children 8 years and below enter freely. Which of the following pupils will gain the entry to the show?

Kato 7years, Sarah 8years, Okoth 10 years and Abby 4 years.

5. Matthew scored 98 marks, otto scored 75 marks, Lillian 98 marks. The pass mark is more than 50.

a) Which pupil passed the exams?
b) If p is the pass mark, then which children form the solution set $P \leqslant 50$?

6. The temperature of a patient was taken.Peter was 36.5^{0c}.Akello 36.2^{0c},Batte 37^{0c} and Mwesigye 38^{0c}.

a) Using T as the subject, write an inequality.

b) If the normal has a higher temperature possibly fever, which patient is normal?

7. A doctor prescribed a dosage for children. She said for children above 8 years but not less than 17 years take 2 spoonful a day. Write an inequality in which you express the age limit using D?

Ref: New MK pupils' book 7
Pages 450-4551